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# Research Note

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## IMPROVING COMPOSITION IN YOUNG WESTERN WHITE PINE STANDS

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Future stands in the western white pine type must contain a high proportion of good quality white pine to justify the large investments for blister rust control. Overdense and stagnated stands, dominated by undesirable species, frequently occur on burned-over areas or result from harvest cutting methods which favor species other than white pine. Such stands can be improved by controlling stand composition and density, and this can be done most effectively and with the least cost[1/] during the juvenile stage of the stand. Cleanings or weedings made when the stand is between 10 and 20 years of age will result in a high proportion of good quality white pine in future stands.

The results of two tests of cleaning, one in the Kaniksu National Forest and one in the Coeur d'Alene National Forest, in northern Idaho, show how cleaning should be done to be effective. The Kaniksu plots,[2/] established in 1935 in the Upper West Branch drainage of Priest River, test the release of white pine from competing western larch and other species. The stand of dense reproduction averaged 8 years in age and originated on a 1926 burn. Total number of trees per acre at the time of cleaning ranged from 9,000 to 21,000 with an average of 13,000.

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1/ A good discussion of the financial returns from intermediate cuttings in western white pine forests is given on pages 33-40 of "Economic Management of Western White Pine Forests," by Kenneth P. Davis, USDA Technical Bulletin No. 830, August 1942.

2/ Fourth-year results of this test were given in Northern Rocky Mountain Forest and Range Experiment Station Research Note No. 4, by C. A. Wellner, March 1940.

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Composition of the stand is given below.

| Species | Percent of total stand |
|---|---|
| Western white pine | 5 |
| Western larch | 45 |
| Western hemlock | 25 |
| Western redcedar | 15 |
| All other species | 10 |
| Total | 100 |

Although white pines were adequate in number for satisfactory stocking, they were badly overtopped and crowded by other species, especially larch. A cleaning or weeding was necessary if the stand at harvest was to contain a satisfactory proportion of the valuable white pine.

Treatment of three plots, each 0.4 acre in size, was as follows:

Check plot. Left undisturbed as a check area.

Moderate cleaning. All white pine and cedar were left. Engelmann spruce and Douglas-fir were cut only when crowding white pine. All larch within 8 feet of white pine were cut. In the absence of white pine, smaller larches were left with an 8-foot spacing.

Heavy cleaning. All reproduction except that of white pine and cedar was cut.

The plots were cleaned by CCC enrollees using hand pruners, and cutting the trees close to the ground. Only reproduction over 0.5 foot in height was cut in cleaning or considered in stand tallies. Although costs were not kept for this job, cleanings similar to these have required from 1 to 5 man-days per acre.

Results of the cleaning in releasing pine are best shown by studying the dominant trees. The tallest tree on each milacre (6.6 by 6.6 foot square) unit of area was considered the dominant tree for that unit, and the sum of these milacre dominants on 336 milacres within each plot was assumed to make up the dominant stand. The moderate cleaning increased white pine in the dominant stand from 1 percent before cleaning to 45 percent after cleaning (Table 1). The increase on the heavily cleaned plot was greater, from 9 to 70 percent. It is evident that cleaning was very effective in changing the position of white pine from one of subordinance to one of dominance.

Table 1.--Composition of the dominant stand, Upper West Branch cleaning

| Species | Check Plot | | Moderately cleaned plot | | | Heavily cleaned plot | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1935 before cleaning | 1935 after cleaning | | 1935 before cleaning | 1935 after cleaning | |
| | 1935 | 1944 | | | 1944 | | | 1944 |
| | Percent | Percent | Percent | Percent | Percent | Percent | Percent | Percent |
| Western white pine | 1 | 1 | 1 | 45 | 22 | 9 | 70 | 40 |
| Western larch | 90 | 83 | 96 | 35 | 62 | 80 | 0 | 31 |
| Lodgepole pine | 9 | 15 | 1 | 0 | 1 | 4 | 0 | 3 |
| Western redcedar | 0 | 0 | 0 | 10 | 3 | 2 | 30 | 16 |
| Others | 0 | 1 | 2 | 10 | 12 | 5 | 0 | 13 |
| All species | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

During the 9-year period after cleaning, white pine lost ground to western larch. Small larches left in cleaning and trees of this species less than 0.6 foot in height in 1935 have shown remarkable height growth, often overtopping pine. This is not as serious, however, as the figures in the foregoing table might indicate. Formerly each pine had to compete with many larches; now with relatively few. In addition, height growth of the average pine has been much greater on the cleaned plots than on the check plot. Table 2 shows the favorable growth white pine is making on the cleaned areas.

Table 2.--Average height of all trees, Upper West Branch cleaning

| Species | Check plot | | Moderately cleaned plot | | | Heavily cleaned plot | | |
|---|---|---|---|---|---|---|---|---|
| | 1935 | 1944 | 1935 before cleaning | 1935 after cleaning | 1944 | 1935 before cleaning | 1935 after cleaning | 1944 |
| | Feet | Feet | Feet | Feet | Feet | Feet | Feet | Feet |
| Western white pine | 1.7 | 4.6 | 1.6 | 1.6 | 8.3 | 2.3 | 2.3 | 11.4 |
| Western larch | 3.0 | 13.2 | 4.0 | 2.0 | 10.8 | 4.4 | - | 10.3 |
| Lodgepole pine | 3.4 | 16.2 | 3.1 | - | 11.7 | 6.0 | - | 10.7 |
| Western hemlock | 1.1 | 2.6 | 1.2 | 1.0 | 2.6 | 1.3 | - | 4.3 |
| Western red-cedar | 1.0 | 2.2 | 1.0 | 1.0 | 2.6 | 1.1 | 1.1 | 4.1 |

The necessity for making a heavy cleaning in the first operation and the desirability of a follow-up cleaning in 3 to 5 years to make good the job is emphasized in tables 2 and 3. A second cleaning could have been made in 1939 at a very low cost to produce almost pure white pine in the dominant stand.

Results from the test on the Coeur d'Alene National Forest also bring out the necessity for a heavy cleaning in the first operation and the desirability for a follow-up cleaning in 3 to 5 years. In addition, this test shows that cleaning should not be done until the stand is well developed; i.e., the average stand age is at least 10 years.

The Coeur d'Alene test was started in 1939 on a northerly slope in Lone Cabin Creek. It was made in a reproduction stand of western white pine, western larch, Douglas-fir, western hemlock, and grand fir, ranging from 2 to 8 years in age, which came in after a seed tree cutting made in 1930 that was followed by hemlock disposal by felling and pile burning in 1931. Cleaning was done on 56 acres and untreated strips 2 chains in width were left as checks throughout the area.

The cleaning was very light. Approximately 200-300 of the best white pines per acre were released from competition of other species of equal or greater height for a distance of 6 feet. This resulted in cutting dominant western larch and some grand firs, Douglas-firs and hemlocks. However, trees of these species smaller than pine were left. Dominant larches, when in a group, were not cut to favor one or two spindly pines. The resulting

cleaning was very light and required 1.4 man-days per acre.

No measurements of the stand were made in 1939, but stand tallies and height measurements were taken in 1945, six years after cleaning.

No appreciable difference was apparent in the dominant stand between the cleaned and undisturbed check areas six years after treatment (Table 3). On this basis the cleaning could be judged a complete failure. So many small larches, grand firs, and Douglas-firs were left at the time of cleaning that they, especially larch, have outgrown white pine and kept it in the same relative position on the cleaned as on the check area.

Table 3.--Composition of the dominant stand in 1945, Lone Cabin Creek cleaning

| Species | Check stand | Cleaned stand |
|---|---|---|
| | Percent | Percent |
| Western white pine | 39 | 37 |
| Western larch | 30 | 27 |
| Douglas-fir | 3 | 5 |
| Grand fir | 16 | 18 |
| Western hemlock | 12 | 12 |
| Others | - | 1 |
| All species | 100 | 100 |

However, some effect of the cleaning is shown by height measurements (Table 4). The average height of western larch, Douglas-fir, and grand fir is less on the cleaned area than on the untreated check area. White pine has therefore been given a slight relative advantage.

Table 4.--Average height of all trees in 1945, Lone Cabin Creek cleaning

| Species | Check stand | Cleaned stand |
|---|---|---|
| | Feet | Feet |
| Western white pine | 4.5 | 4.4 |
| Western larch | 8.8 | 6.4 |
| Douglas-fir | 4.5 | 2.7 |
| Grand fir | 5.0 | 3.2 |
| Western hemlock | 2.4 | 2.5 |

This test shows: (1) that the cleaning should have been much heavier; (2) the desirability of a follow-up cleaning 3 to 5 years after the first cleaning to maintain the lead of white pine; and (3) that cleaning should be delayed until the stand is well developed and dominance is well established.

## CONCLUSIONS

Stand composition and density in western white pine forests can be controlled most effectively, and with the least cost by cleanings made during the juvenile stage of the stand. To be most effective, cleanings should be delayed until dominance is well established (stand age usually about 10 years), at which time the cleaning operation should be heavy. Not only trees of equal or greater height than white pine but also trees of lesser height, especially of the intolerant species, should be cut. A follow-up cleaning in 3 to 5 years after the first cleaning is desirable to maintain the lead of western white pine. Through cleanings effectively applied a high proportion of western white pine can be maintained in future stands.